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Proceedings of the zonal peer review meeting on the identification of Ecologically and Biologically Significant Areas (EBSAs) in the coastal zone of the Estuary and Gulf of St. Lawrence

December 16-17, 2014
Mont-Joli, Quebec

Co-chairs: Charley Cyr and Gérald Chaput
Rapporteur: Sonia Dubé

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Canada

Foreword

The purpose of these proceedings is to document the key activities and discussions of the meeting. The Proceedings may include research recommendations, uncertainties and the rationale for decisions made during the meeting. The Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. Therefore, interpretations and opinions presented in this report may be factually incorrect or misleading, but are included to record, as faithfully as possible, what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available within the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Appendices to the Proceedings.

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SUMMARY

This document contains the proceeding of the zonal peer review meeting on the Identification of Ecologically and Biologically Significant Areas (EBSAs) in the coastal zone of the estuary and the Gulf of St. Lawrence. This review process was held on December 16-17, 2014 at the Maurice Lamontagne Institute in Mont-Joli. Thirty participants from DFO Science, management and universities contributed to the discussions. These proceedings contain the essential parts of the presentations and discussions and summarize the recommendations and conclusions of the review.

SOMMAIRE

Ce document renferme le compte rendu de la réunion zonale d'examen par des pairs portant sur l'identification des zones d'importance écologique et biologique (ZIEB) du milieu côtier dans l'estuaire et le golfe du Saint-Laurent. Cette revue, qui s'est déroulée les 16 et 17 décembre 2014 à l'Institut Maurice-Lamontagne à Mont-Joli, a réuni une trentaine de participants des sciences, de la gestion et des universités. Ce compte rendu contient l'essentiel des présentations et des discussions qui ont eu lieu pendant la réunion et fait état des recommandations et conclusions émises au moment de la revue.

INTRODUCTION

The Oceans Act also confers to Fisheries and Oceans Canada (DFO) on behalf of the Government of Canada, the responsibility to lead and coordinate the establishment of a network of marine protected areas. This departmental objective is delivered in large part by the identification of Ecologically and Biologically Significant Areas (EBSA). In 2006, DFO completed a peer review to identify Ecologically and Biologically Significant Areas in the estuary and the Gulf of St. Lawrence. Ten EBSAs were identified, all located in the offshore areas (DFO 2007). There was no consensus during the peer review meeting of 2006 on the approach to take to assess EBSAs in the estuarine and coastal areas of the gulf. The major impediment was associated with applying assessment criteria specific to large scale characteristics or oceanographic processes to the estuary and coastal areas (DFO 2006). As a result, a large part of the coastal zone was excluded during the 2006 EBSA assessment. The identification of EBSAs in the coastal zone is required to complete the ecological profile for the planning of the network of marine protected areas of the estuary and the Gulf of St. Lawrence and to support research on vulnerabilities of this ecosystem.

This document consists in the proceedings of the zonal peer review meeting on the identification of EBSAs in the coastal zone of the Estuary and Gulf of St. Lawrence, which was held on December 16 and 17, 2014. The purpose of the meeting was to determine whether criteria for identifying EBSAs (DFO 2004) can be applied to the coastal zone and, if the coastal zone meets the EBSA criteria, to identify the areas, characteristics or habitats in the coastal zone that could be designated as EBSAs based on these criteria. The exercise was done mainly using available data on benthic invertebrates and fish.

This proceedings report outlines the key points of the presentations and discussions that took place during the meeting. This meeting is a process open to all participants who are able to provide a critical outlook within the terms of reference that have been defined (Appendices 1 and 2). The proceedings also focus on recommendations made by the meeting participants.

CONTEXT

The meeting is co-chaired by Charley Cyr (Quebec Region) and Gérald Chaput (Gulf Region). Mr. Cyr welcomes the participants. He outlines the meeting objectives and procedures. The agenda is presented and the participants introduce themselves. Two separate exercises were conducted to identify EBSAs in the coastal zone of the Estuary and Gulf of St. Lawrence. There are two working documents to be reviewed: one on the southern Gulf of St. Lawrence, produced by Amélie Rondeau et al., and another covering the coastal area of the Estuary and Northern Gulf of St. Lawrence, produced by Yanick Gendreau et al. Based on these documents and the discussions held at the meeting, the meeting participants will have to issue a science advisory report regarding the identification of EBSAs.

1. IDENTIFICATION OF EBSAS IN THE COASTAL ZONE OF THE SOUTHERN GULF OF ST. LAWRENCE

First, Ms. Rondeau meets objective 1 of the terms of reference, which was to determine whether the criteria for identifying EBSAs—uniqueness, aggregation, fitness consequences, resilience and naturalness— apply to the coastal zone. Ms. Rondeau says that, according to the research, these criteria can be applied to the coastal zone as specified in the science advisory report produced by Fisheries and Oceans Canada on lessons learned in the identification of EBSAs (DFO 2011). However, in this exercise, participants will focus on the first three criteria:

uniqueness, aggregation and fitness consequences. Ms. Rondeau also reminds participants of the definition of the coastal zone to be used for this work. This zone includes waters no more than 40 m deep, but excludes estuaries in the southern Gulf. Ms. Rondeau says that in an earlier exercise (DFO 2007) during which 10 EBSAs were identified, primarily in offshore areas, two EBSAs that included coastal waters ≤ 40 m had nevertheless been identified: the Western Northumberland Strait EBSA, and the St. George's Bay EBSA.

APPROACH, DATABASES AND SELECTION OF SPECIES

Ms. Rondeau presents the approach used in this exercise, the study area, as well as the databases used, i.e. the September multi-species trawl survey data, Northumberland Strait trawl survey and scallop dredge survey. The snow crab survey was not selected because few data were collected in coastal areas based on the definition used for this exercise. Additional sources were used to validate the information, such as the atlas of the geographic distribution of marine fish and invertebrates in the southern Gulf of St. Lawrence, research documents related to the September survey, fishing data, and information from the literature and experts. Forty-four fish species and 38 invertebrate taxa were selected among 84 fish species and 148 invertebrate taxa, based on various criteria (minimum 10 occurrences, reliable identification, aggregating species to higher taxonomic levels, catchability and/or representativeness).

DATA PROCESSING

Georeferenced data from three surveys were combined into a single data matrix and converted to presence/absence. Generalized Additive Models (GAMs) were used to calculate a catch probability in each cell. The model was adjusted for 14 taxa and takes into account various effects: spatial, fishing gear, bottom temperature and depth. Catch probability maps were produced by species/taxon. The maps are produced separately for fish and invertebrates based on the sum of catch predictions for each species/taxon for each cell of the spatial grid.

- Ms. Rondeau says there may be under-representation (bias) related to the selection of species and groups.
- Participants discuss the decision to use the presence/absence approach. It seems that working with the original data (weight) would not have been more helpful in the context of this exercise.
- A participant points out that these are catch probability maps, not species distribution maps. These maps must be presented species by species in the research document.
- Although catch probability maps are limited to the coastal zone in the context of this exercise, we must keep in mind that offshore data (waters > 40 m deep) are extrapolated to the coast for species/taxa in the September multi-species survey.

AREAS OF INTEREST, EVALUATION MATRIX AND EBSAS

To identify EBSAs, we started with eight Areas of Interest (AOIs) based on bathymetry and the 2006 exercise, which we assessed based on five ecological functions (feeding, spawning/breeding, growth/fry rearing, migration and seasonal refugia) and the three initial criteria or properties (uniqueness, aggregation, and fitness consequences). Given the ecological functions, it became evident to the work team that the analysis should be limited to fish (and one native invertebrate species: Calico Crab). Therefore, the evaluation matrix (ecological functions, properties) was applied to all species of fish using the AOIs. Particular attention was paid to species at risk. Based on this approach, the eight AOIs were given a score.

- A few clarifications are made regarding the approach used. The participants agree on the importance of clearly describing the approach in the research document.

- It is pointed out that the probability maps produced are only one of the sources of information used in the evaluation.
- Participants ask questions about how to take into account temporal changes in the ecosystem. The fact that special attention is being paid to species at risk is encouraging.
- Participants wonder about the decision to exclude invertebrates from the final evaluation (evaluation matrix), since the purpose of this exercise is to identify EBSAs. According to the work team, catch probability maps for invertebrates do not provide any more information than the 2006 exercise did.
- The results are highly influenced by the lack of data in coastal areas. It is therefore important to keep in mind that this is a major shortcoming of this exercise.

FINAL EVALUATION RESULTS

The results of this exercise indicate that two AOIs could be characterized as EBSAs: Northumberland Strait and St. George's Bay, as identified in the previous exercise (DFO 2007). A brief overview of the main reasons these two areas are eligible is presented. The eastern New Brunswick and Chaleur Bay AOIs deserve special consideration, given their importance as a migratory corridor for many fish species.

- Some participants think that certain areas should be divided in order to identify the EBSAs (e.g. the east and west sections of the Northumberland Strait), which Management would no doubt find more useful.
- A Management representative says that in developing the network of marine protected areas in the Estuary and Gulf of St. Lawrence, Management primarily uses underlying EBSA information layers.
- He also says these information layers will be difficult to use if data on the entire Gulf are not included. It would be very helpful to include data from the exercises involving the southern Gulf, and the exercise for the northern Gulf, which is to be presented later in the meeting.

Finally, Ms. Rondeau outlines the major shortcomings associated with this exercise, including incomplete sampling in the coastal zone, lack of information on infauna and epifauna, as well as gaps in identifying certain species of invertebrates.

- Other shortcomings are raised by participants, such as the failure to include data on marine mammals, seabirds, and physical and oceanographic characteristics (structural factors).
- It is suggested that the limitations be introduced earlier in the body of the document to clarify the approach and choices.

2. IDENTIFICATION OF EBSAS IN THE COASTAL ZONE OF THE GULF OF ST. LAWRENCE BASED ON DISTRIBUTION OF BENTHIC INVERTEBRATES

As an introduction to the exercise completed by the other team for the coastal zone of the Estuary and Gulf of St. Lawrence, Chris McKindsey begins by discussing EBSA criteria, and comparing them to the similar criteria of the Convention on Biological Diversity. He defines the purpose of the exercise, as well as the study area and subareas: the North Gulf shelf, the Laurentian Channel, the Magdalen Shallows, and the St. Lawrence Estuary. The exercise involves modelling the distribution of macrobenthic invertebrates in the study area, producing known and predicted distribution maps, using them to produce richness and scarcity distribution maps, and finally, using these maps to identify areas that meet EBSA criteria. Mr. McKindsey also describes the data sources used (DFO databases, raw data from scientists, the literature, traditional knowledge), as well as the sampling effort. He mentions that very little data are

available for areas along the coast of the Lower North Shore, Anticosti Island, the Magdalen Islands and western Newfoundland.

- Some participants believe the results may be closely linked to the availability of data, and therefore, the surveys considered. Questions are raised regarding this matter. As a result, this cannot reflect actual biodiversity.

MODELLING

Yanick Gendreau presents the modelling approach used, which is based on a distribution model (Maxent ecological niche model). For modelling, the team worked with occurrence data (88 out of 1161 taxa selected) and environmental data (20 environmental variables reduced to 10 following principal component analysis) in order to predict the probability of occurrence with respect to physical and environmental factors. These data are then converted to presence/absence data.

- A participant says that each line represents a set of environmental variables. A meeting participant says that given the importance of these variables to modelling, it is important to clearly identify the source of these data; the reference corresponds to only some of the data.
- Some participants point out the limitations of the model because it produces nonsensical values. For example, it predicts the absence of lobsters in the Magdalen Islands or commercial bivalve species in the southern Gulf of St. Lawrence (e.g. softshell clams, clams, surfclam, blue mussels, etc.). It is clear that if we look at the data species by species, we will find errors. This is more of a meta-analysis.
- A participant asks about the possibility of working with probabilities of occurrence rather than presence/absence, or setting a threshold to qualify presence. Would we get the same results by limiting ourselves to a few variables? Should we exclude samples with a single species? A participant says that despite the various modelling issues, the main problem in this exercise is the lack of data.
- The main question is primarily whether we would rather work with raw, but incomplete data, or with modelled data, which can cover a larger area, but must be interpreted with caution.

DISTRIBUTION MAPS AND SUGGESTIONS FOR EBSAS

Modelling is used to produce richness and scarcity distribution maps: observed species richness, modelled species richness, scarcity index. These maps are used to provide suggestions for EBSAs by subarea: Estuary (north shore downstream from the Saguenay and south shore around Trois-Pistoles and upstream from Matane), Laurentian Channel (north shore), North Gulf Shelf (western tip of the area to the east of the Mingan Archipelago), Magdalen Shallows (north and south of Chaleur Bay, Magdalen Islands). Mr. Gendreau also mentions a few possible improvements, such as using unpublished data and geophysical models (e.g. Greenlaw), adding missing data (Calico Crab, community groups, data from Larocque, Himmelman, etc.), reducing the spatial scale to include small habitats and finally, including fish.

- Some participants believe it is risky to make projections on the shores of Newfoundland, Anticosti Island and the Lower North Shore, given that environmental conditions are very different in these areas. A participant says the interpolations seem realistic. The problem actually lies with extrapolations.
- According to some participants, modelling does not provide reliable additional information.
- Participants come back to the same old question: Should we work with raw, but very incomplete data, or with modelled data that provide broader coverage but contain some unreliable predicted data?

- The participants believe it may be risky to present existing maps without qualification. A participant also suggests masking areas on the maps where data appear unreliable. We could also distinguish between "known absence" and "no information" or "presence observed" or "not observed" in surveyed areas.
- Some participants believe the maps clearly reflect sampling efforts and type. The data sources (type of survey and fishing gear used) should therefore be clearly described in the research document.
- As mentioned during the first presentation, it is also important to keep in mind that the data were extrapolated toward the coast, based on surveys conducted further offshore. Extrapolated data should not be used to determine the significance of a species in coastal areas. However, excluding offshore species from the exercise would considerably reduce the already very limited amount of data available.
- The failure to include fish appears to be a major shortcoming. However, the data on fish seem to be far too incomplete to be included, according to the work team.
- A participant also suggests that we consider the link between areas of greater richness and physical processes or environmental variables prevalent in these areas. For example, some of the areas identified appear to be related to upwelling areas.
- Some participants believe the data from the two exercises are not consistent. Integration work would be very useful.
- Inclusion of the west coast of Newfoundland would also provide an overall picture of the Gulf, and enable us to respond to Oceans Management's request.
- For better use by Management, it would also be advisable to refine area boundaries, and define them more clearly in order to protect them, because expanding the areas may have the opposite effect. We could, for example, identify "hotspots."

3. SUMMARY AND DISCUSSIONS

Mr. Chaput starts the second day of the meeting with the agenda: summarize the work presented, review the components of the terms of reference to be delivered at the end of the meeting, identify the data needed to address the terms of reference (identification of EBSAs in coastal zones of the Estuary and Gulf of St. Lawrence), and identify the next steps and work to be done.

First, Mr. Chaput reminds the participants that the criteria for identifying EBSAs can be applied to the coastal zone. However, based on the information presented and on discussions, it is decided that no science advisory report will be produced on the issue of EBSAs in the coastal zone. Further work remains to be done.

Then, he briefly reviews the key points of the work presented. Participants make some comments.

- Participants discuss the possibility of including estuaries, given their importance. In particular, the presence of eelgrass in the Gulf estuaries requires special attention. It seems that the lack of data is still a problem (there are no systematic surveys). In the southern Gulf, estuaries are being considered to some extent because anadromous and catadromous species are included.
- A participant reminds everyone that during the 2010 meeting in Moncton, the coastal zone was defined as the area extending between marine waters ≤ 30 m deep and the upstream boundary of 0 ppm estuaries.
- Some participants suggest that certain species, including lobster, Snow Crab and macroalgae be considered. Adding marine mammals and seabirds might be worthwhile.

Some had also suggested adding "indicator" species, but did not really define the term "indicator."

With regard to the components of the terms of reference that can be delivered after this meeting, Mr. Chaput mentions catch probability maps for 44 fish species and 38 invertebrate taxa in the southern Gulf and the Magdalen Islands, and richness/scarcity maps for benthic invertebrates in the St. Lawrence Estuary and the Upper North Shore. Thus, the proceedings for the meeting and two research documents containing these maps can be provided.

- It is specified that the coastal zone includes waters no more than 40 m deep, excluding estuaries other than the St. Lawrence Estuary.
- A participant points out that data on invertebrates in the southern Gulf could no doubt be included in the second exercise (with Maxent) in order to produce a more global picture. Other easily accessible data sets could also be included to complete the information.
- It is necessary to determine whether the resources are available in the short term to do the integration work; then, it will be important to compile and validate the list of databases to be integrated.
- A Management representative says these various information layers can be useful, although a science advisory report on EBSAs cannot be provided at this time. The representative also notes that in order to develop a marine protected areas network, the analysis for identifying EBSAs should cover the entire Estuary and Gulf of St. Lawrence, including the west coast of Newfoundland.

With a view to the longer term, the participants discuss the missing information. For the southern Gulf, participants mention data on shrimp (multi-species survey), sessile invertebrates, herring spawning grounds and capelin spawning areas, algae and marine plants. For the Estuary and northern Gulf of St. Lawrence, participants mention data on fish (surveys and fishing), capelin spawning areas, eelgrass distribution data, ZIP committee data, algae and marine plants.

- However, participants note that some data are not captured, which would therefore require significant resources (e.g. shrimp); other data are unavailable or too fragmented.
- Participants discuss whether peripheral species should be considered, i.e., offshore species at the edge of the coastal zone. Maps with and without these species could be presented, but it is important to first agree on the list of species considered peripheral (e.g., Witch Flounder, Snow Crab, Turbot).
- Other participants think that the significant range of physical and oceanographic factors in coastal environments (see Geobases) must be considered.

4. WORK TO BE DONE

Finally, the participants discuss the next steps and the work to be done. Participants discuss what can be provided in the short and longer terms (with more resources). Lastly, the following plan is proposed by the participants.

IN THE SHORT TERM:

- Redo the analyses with Maxent, adding the Southern Gulf data on invertebrates (Northumberland Strait database). The proposed work team is: Chris McKindsey, Yanick Gendreau, Michel Comeau and Amélie Rondeau.
- Examine and group fish and invertebrates species into peripheral and coastal categories. Produce maps by species and pseudo-diversity (with and without peripheral species) and identify "hotspots" without delineating their geographic shape. The

proposed review team is: Chris McKindsey, Bernard Sainte-Marie, Yanick Gendreau, Michel Comeau, Amélie Rondeau and Mark Hanson.

- Validate predictions for species in the Estuary and Northern Gulf of St. Lawrence. The proposed validation team is: Chris McKindsey, Bernard Sainte-Marie, Yanick Gendreau, Michel Comeau, Amélie Rondeau, Hugo Bourdages, Sylvie Brulotte and Marc Ouellette.

OVER THE LONGER TERM:

- Re-examine other available and relevant information layers that we want to integrate.
- Review the preferred approach for identifying EBSAs. Participants agree that Management must update its request once the reports are submitted (research documents, proceedings).
- The issue of whether or not to include estuaries and the west coast of Newfoundland remains unresolved.

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DFO. 2006. Proceedings of the Zonal Workshop on the Identification of Ecologically and Biologically Significant Areas (EBSA) within the Gulf of St. Lawrence and Estuary. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2006/011.

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DFO. 2011. Ecologically and Biologically Significant Areas – Lessons Learned. DFO Can. Sci. Advis. Sec. Sci. Adv. Rep. 2011/049.

APPENDICES

1. LIST OF PARTICIPANTS

Name	Affiliation	Dec. 16	Dec. 17
Albert Élaine	DFO – Oceans Management, Quebec Region	X	X
Archambault, Philippe	UQAR/ISMER	X	X
Bourdages, Hugo	DFO Science – Quebec Region	X	X
Brulotte, Sylvie	DFO Science – Quebec Region	X	X
Cairns, David	DFO Science – Gulf Region	X	X
Cantin, Guy	DFO – Oceans Management, Quebec Region	X	X
Castonguay, Martin	DFO Science – Quebec Region	X	
Chabot, Denis	DFO Science – Quebec Region	X	X
Chaput, Gérald	DFO Science – Gulf Region	X	X
Comeau, Michel	DFO Science – Gulf Region	X	X
Cyr, Charley	DFO Science – Quebec Region	X	X
Dallaire, Jean-Paul	DFO Science – Quebec Region	X	
Dubé, Sonia	DFO Science – Quebec Region	X	X
Gendreau, Yanick	DFO Science – Quebec Region	X	X
Gilbert, Michel	DFO Science – Quebec Region	X	
Godin, Carole	DFO – Fisheries Protection, Gulf Region	X	X
Hazel, François	DFO – Fisheries Protection, Quebec Region	X	X
Lanteigne, Marc	DFO Science – Gulf Region	X	X
Ouellette, Marc	DFO Science – Gulf Region	X	X
Ouellet, Patrick	DFO Science – Quebec Region		X
MacIsaac, Ray	DFO – Oceans Management, Gulf Region	X	X
McKindsey, Chris	DFO Science – Quebec Region	X	X
Robichaud, Paul	DFO Science – Quebec Region	X	
Rondeau, Amélie	DFO Science – Gulf Region	X	X
Sainte-Marie, Bernard	DFO Science – Quebec Region	X	X
Savenkoff, Claude	DFO Science – Quebec Region	X	X
Simard, Nathalie	DFO Science – Quebec Region	X	X
Trottier, Steve	DFO Science – Quebec Region	X	X
Weise, Andrea	DFO Science – Quebec Region	X	X

2. TERMS OF REFERENCE

Identification of Ecologically and Biologically Significant Areas (EBSAs) in the coastal zone of the Estuary and Gulf of St. Lawrence.

Zonal Peer Review – Quebec and Gulf Regions

December 16 and 17, 2014
Mont-Joli, QC

Co-chairs: Charley Cyr (DFO Quebec Region) and Gérald Chaput (DFO Gulf Region)

Background

The *Oceans Act* tasks Fisheries and Oceans (DFO) with leading and coordinating the development and implementation of a national network of marine protected areas on behalf of the Government of Canada. This departmental priority largely depends on the identification of Ecologically and Biologically Significant Areas (EBSAs). In 2006, DFO completed a major peer review to identify EBSAs in the Estuary and Gulf of St. Lawrence. Ten EBSAs were identified, but most were located in the offshore area (DFO 2007). Discussions were held on including estuarine and coastal areas in the EBSA assessment for the Gulf, but no consensus was reached on an approach. The challenge was to consider the specific ecological and biological features of coastal and estuarine areas in a classification system based solely on large-scale oceanographic characteristics or processes (DFO 2006). As a result, the entire coastal zone was excluded during the 2006 EBSA assessment. EBSAs in the coastal zone must therefore be identified to complete the ecological profile, which will be used to plan a network of marine protected areas in the Estuary and Gulf of St. Lawrence, and study the vulnerabilities of this ecosystem.

In addition, under the *Fisheries Act*, *Species at Risk Act* and *Canadian Environmental Assessment Act*, DFO must regularly assess the effects and impacts of infrastructure development or protection projects on coastal habitats (salt marshes, beaches used or potentially used as capelin spawning grounds, eelgrass beds, river estuaries). To help DFO develop an overall strategy and establish priorities for the protection of habitats in coastal areas, areas of ecological importance must be identified in order to guide decisions on the type of response to be recommended, and propose prevention or restoration measures.

Objectives

The objectives of the meeting are as follows:

- Determine whether criteria for identifying ecologically and biologically significant areas (DFO 2004) can be applied to the coastal zone.
- If the coastal zone meets the criteria for EBSAs, identify the areas, characteristics or habitats in the coastal zone that could be designated as EBSAs based on these criteria.

Expected publications

- Science Advisory Reports
- Research Documents
- Proceedings

Participation

- Fisheries and Oceans Canada (DFO) (Ecosystems and Oceans Science Sector, Ecosystems and Fisheries Management Sector)

- Invited experts

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